National Transportation Safety Board
Aviation Incident Final Report

Location:	ATLANTA, GA	**Incident Number:**	ATL95IA043
Date & Time:	01/19/1995, 0940 EST	**Registration:**	N4515W
Aircraft:	BOEING 737-247	**Aircraft Damage:**	Minor
Defining Event:		**Injuries:**	28 None
Flight Conducted Under:	Part 121: Air Carrier - Scheduled		

Analysis

THE FLIGHT CREW REPORTED THAT THE FLIGHT PROCEEDED NORMALLY UNTIL THE LANDING ROLL. THE FIRST OFFICER FELT THE ANTISKID RELEASING, AND THE CAPTAIN TOOK OVER THE CONTROLS. BRAKING ACTION WAS INITIALLY FELT, THEN ALL BRAKING ACTION WAS LOST. THE AIRCRAFT DEPARTED THE END OF THE RUNWAY, AND CAME TO A STOP ABOUT 200 FEET PAST THE DEPARTURE END, IN THE GRASS. THE LEFT OUTBOARD MAIN TIRE WAS BLOWN. EXAMINATION OF THE AIRCRAFT REVEALED THAT THE LEFT, INBOARD ANTISKID VALVE BRAKE AND RETURN LINES WERE CROSSED. THE LEFT, INBOARD SKID DETECT CIRCUIT WAS FOUND INOPERATIVE. ALSO, THE WIRING TO THE LEFT, INBOARD AND LEFT, OUTBOARD WHEEL SPEED TRANSDUCERS WERE CROSSED. THERE WAS ALSO EVIDENCE THAT THE AIRCRAFT HAD HYDROPLANED NEAR THE DEPARTURE END OF THE RUNWAY. THE AIRCRAFT DISCREPANCIES WERE NOT DISCOVERED DURING ANTISKID SYSTEM TESTING PERFORMED ABOUT 2 WEEKS PRIOR TO THE ACCIDENT.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: THE INADEQUATE INSPECTION OF THE AIRCRAFT BY OTHER MAINTENANCE PERSONNEL, IN THAT THEY DID NOT PROPERLY DIAGNOSE DISCREPANCIES IN THE ANTISKID BRAKING SYSTEM.

Findings

Occurrence #1: OVERRUN
Phase of Operation: LANDING - ROLL

Findings
1. (C) HYDRAULIC SYSTEM,LINE - MISROUTED
2. (C) LANDING GEAR,ANTI-SKID BRAKE SYSTEM - FAILURE,PARTIAL
3. (C) MAINTENANCE,INSPECTION - INADEQUATE - OTHER MAINTENANCE PERSONNEL

Factual Information

HISTORY OF FLIGHT

On January 19, 1995, at 0940 eastern standard time, a Boeing 737-247, N4515W, overran runway 9R at the Hartsfield Atlanta International Airport, in Atlanta, Georgia. There were no injuries to the airline transport captain and first officer, the three flight attendants, and the 23 passengers. The aircraft had minor damage. Flight 312 was operated under the provisions of 14 CFR Part 121 by Air South, Inc. Instrument meteorological conditions existed at the time, and an instrument flight rules flight plan was in effect for the scheduled, domestic, passenger flight. The flight originated in Columbia, South Carolina at 0850.

The captain stated the following: the engine start, taxi, and takeoff from Columbia were "ops normal." There were no unusual aircraft logbook entries; nothing pertaining to the brakes, anti-skid system, hydraulics, etc. The brakes seemed to perform normally on the ground in Columbia. There were no abnormal gauge indications, nor any warning or caution lights during the entire flight. The instrument landing system (ILS) approach and touchdown to runway 9R were normal. The first officer was the flying pilot. The ILS was manually flown, and the aircraft broke out of the weather at about 500 feet above ground level. The computed approach speed was in the mid-130 knot range. Following a normal approach (no glide path deviations were noted), the aircraft touched down about 1,500 to 2,000 feet down the runway, about 120 knots. The first officer reported that he began to apply wheel brakes about 80 to 90 knots. He remarked to the captain that the anti-skid system seemed to be "releasing." Thrust reverser operation was normal in all respects. The captain took control of the airplane, and checked the brakes. Brake pedal pressure was initially felt, then the brake pedals could be pressed all the way to the floor, and no braking action was observed. The aircraft departed the paved surface at the departure end of the runway. The aircraft came to a stop on the grass, about 200 feet beyond the edge of the departure end threshold.

The captain stated that there were never any cockpit indications indicating brake or hydraulic system problems during the landing roll. The captain did not feel that the aircraft had been hydroplaning, and in his opinion, the runway was dry. The first officer described the runway as having "damp spots."

PERSONNEL INFORMATION

Information of the captain is contained in this report at the section titled "First Pilot Information." Copies of his training records are included as an attachment to this report.

Information on the first officer is contained in this report at Supplement E. Copies of his training records are included as an attachment to this report.

AIRCRAFT INFORMATION

According to Air South personnel, the aircraft had been recently acquired, and had been in operation for about 35 hours (44 cycles) since Air South's acquisition.

The aircraft underwent maintenance work at AAR Oklahoma, Inc. prior to its acceptance by Air South. According to non-routine forms provided by the operator, on January 5, 1995, a ground test of the anti-skid control system was performed in accordance with the Boeing 737 Maintenance Manual Chapter 32-42-0. On January 6, 1995, the left hand inboard and outboard anti-skid control valves were found to be inoperative. They were replaced and

operationally checked. According to maintenance records, the only subsequent work performed on the anti-skid system occurred on January 11, 1995. On that day, the left main landing gear anti-skid harness was resecured, following a writeup indicating that it needed to be secured. This work was performed by the operator.

METEOROLOGICAL INFORMATION

Instrument meteorological conditions existed at the time of the incident. Additional information is located at the section titled "Weather Information."

FLIGHT RECORDERS

The cockpit voice recorder (CVR) and digital flight data recorder (DFDR) were secured following the incident, and forwarded to the NTSB Headquarters in Washington, DC for examination.

An initial readout of the CVR revealed that the unit had not been disabled by the flight crew, thus it continued operating after the aircraft had come to a stop. No useful information was obtained from the recording.

The DFDR data for this incident indicate that the airplane touched down at 132 knots indicated airspeed (IAS), at a pressure altitude of 931 feet, and a magnetic heading of 95 degrees. The data indicate two possible times where the aircraft overran the runway. Assuming a runway length of 9,000 feet, the DFDR data indicated that the airplane touched down either 2,501 or 2,273 feet from the runway 9R approach end. For additional information, refer to the "Digital Flight Data Recorder Study", attached to this report.

WRECKAGE AND IMPACT INFORMATION

The only verified damage to the aircraft was a blown main tire on the left, outboard position. The other three main tires remained intact and inflated, except there was evidence of skidding on the right, outboard tire. The tread of the right, outboard tire showed evidence of rubber reversion. There were skid marks on the runway surface, leading to the tracks in the mud made by the aircraft. An examination of the track which led to the right, outboard tire showed that it had a "steam cleaned" appearance, i.e. it was lighter in color than the surrounding runway surface.

TESTS AND RESEARCH

Following the incident, several tests and examinations were performed. An inspection of the aircraft after the incident revealed that the left, inboard anti-skid valve brake and return lines were crossed. Also, after the aircraft had been returned to service, abnormal main tire wear was observed at the left, outboard position. Further inspection revealed that the wiring to the left, inboard and left, outboard wheel speed transducers were crossed. This discrepancy was corrected, and no further reports of abnormal tire wear were received, or observed.

All four main tires, as well as their respective wheel and brake assemblies, were shipped to Thompson Aerospace, Inc., in Miami, Florida. A functional test of each brake assembly was conducted; all operated normally. Brake wear was not greater than 50 percent on any brake assembly.

The anti-skid control unit, and the number two anti-skid control valve were removed from the incident aircraft. These units were shipped to Aircraft Braking Systems Corporation for testing and examination. Functional testing of the anti-skid valve revealed that it was functional.

Testing of the anti-skid control unit (box) revealed that the left, inboard skid detect circuit was inoperative, due to an open Q24 transistor.

According to the Boeing Commercial Airplane Group, the discrepancies discovered would result in the following:

(1) If the left, outboard wheel started to skid, the wheel speed transducer signal would go to the left, inboard wheel skid detector circuit, which was inoperative. This would have allowed tire damage to occur to the left, outboard tire, since there would be no brake release.

(2) If the left, outboard wheel locked up, the wheel speed transducer signal would go to the left, inboard wheel detector, providing a release of the left, inboard wheel, if the inboard locked wheel protection circuit was armed. Arming of the locked wheel protection circuit occurs when either the inboard wheel spin up to more than 30 mph, or the air/ground sensor switch is in the "air" position, to provide touchdown protection.

(3) With the left inboard valve hydraulic lines crossed, sluggish braking would occur on the left, inboard wheel.

The component examinations did not reveal evidence of malfunction of the right, main gear anti-skid or braking systems. The investigation was not able to determine if the crossed brake and return lines on the left, inboard anti-skid valve had any effect on right side braking.

Boeing Commercial Airplane Group was asked to provide information to determine if the aircraft inspections performed by AAR Oklahoma, Inc. should have uncovered the discrepancies found in N4515W. Regarding the inoperative Q24 transistor, the ground test of the anti-skid system may have been affected by the crossed wheel speed transducer wiring. Without additional testing, it could not be determined if the inoperative Q24 transistor would have been discovered. Regarding the crossed wheel speed transducer wiring, the appropriate test for this was not referenced in the non-routine work cards, however that test is required if the landing gear is replaced. Regarding the crossed anti-skid valve brake and return lines, Boeing reported that this condition would result in sluggish braking on the left, inboard wheel.

ADDITIONAL INFORMATION

The tested aircraft system components were released to the operator, Air South. Inc.

Pilot Information

Certificate:	Airline Transport; Flight Engineer	**Age:**	34, Male
Airplane Rating(s):	Multi-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	01/05/1995
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:	3634 hours (Total, all aircraft), 761 hours (Total, this make and model), 161 hours (Last 90 days, all aircraft), 48 hours (Last 30 days, all aircraft), 8 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	BOEING	**Registration:**	N4515W
Model/Series:	737-247 737-247	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Transport	**Serial Number:**	19612
Landing Gear Type:	Retractable - Tricycle	**Seats:**	130
Date/Type of Last Inspection:	01/19/1995, Continuous Airworthiness	**Certified Max Gross Wt.:**	103500 lbs
Time Since Last Inspection:	2 Hours	**Engines:**	2 Turbo Jet
Airframe Total Time:	37421 Hours	**Engine Manufacturer:**	P&W
ELT:		**Engine Model/Series:**	JT8D-9A
Registered Owner:	MIMI LEASING CORP.	**Rated Power:**	14500 lbs
Operator:	AIR SOUTH, INC.	**Operating Certificate(s) Held:**	Flag carrier (121)
Operator Does Business As:		**Operator Designator Code:**	A6XA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	ATL, 1026 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	1028 EST	**Direction from Accident Site:**	0°
Lowest Cloud Condition:	Unknown / 0 ft agl	**Visibility**	2 Miles
Lowest Ceiling:	Overcast / 300 ft agl	**Visibility (RVR):**	0 ft
Wind Speed/Gusts:	13 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	120°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	
Precipitation and Obscuration:			
Departure Point:	COLUMBIA, SC (CAE)	**Type of Flight Plan Filed:**	IFR
Destination:	(ATL)	**Type of Clearance:**	IFR
Departure Time:	0850 EST	**Type of Airspace:**	

Airport Information

Airport:	HARTSFIELD ATLANTA INTL. (ATL)	**Runway Surface Type:**	Concrete
Airport Elevation:	150 ft	**Runway Surface Condition:**	
Runway Used:	9R	**IFR Approach:**	ILS
Runway Length/Width:	9000 ft / 150 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	5 None	**Aircraft Damage:**	Minor
Passenger Injuries:	23 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	28 None	**Latitude, Longitude:**	

Administrative Information

Investigator In Charge (IIC):	RALPH E HICKS	**Report Date:**	10/13/1995
Additional Participating Persons:	DAVID A DEES; COLLEGE PARK, GA CASSANDRA L JOHNSON; WASHINGTON, DC		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.		